

Report on the Psychology and Sociology of the Todas and other Indian Tribes.

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Six months were spent in India, the greater part of the time being devoted to the investigation of the Todas of the Nilgiri Hills. The senses of these people were examined experimentally on the same lines as those followed by the Cambridge Expedition to Torres Straits.* The general result was to confirm the chief conclusion of this expedition that there are no great differences between the senses of savage and civilised races. In pure sense-acuity little difference was found, and the observations lend no support to the view that the sense-acuity of savage or barbarous races is superior to that of civilised man, the apparent superiority in some cases being due to the training of observation in special directions.

In two senses only is there distinct evidence of difference between Todas and Englishmen in sensory endowment. The Todas are distinctly less sensitive to pain than the average educated Englishman, and they show the same kind of deficiency in the colour-sense which has been found in other races of low culture, especially in the Papuan† and the Egyptian peasant.‡

The Todas are distinctly less sensitive to blue than the average educated Englishman, though differing little in sensibility to red or yellow. This defect in the sensibility for blue is associated with the deficient nomenclature for this colour which is almost universal in races of low culture; and the observations on the Todas strengthen the conclusion reached by previous work that physiological insensitiveness is one, though only one, of the factors upon which the defect in language depends.

The most striking feature of Toda colour-vision, however, is the great frequency of colour-blindness. About five hundred individuals were tested, and over 12 per cent. of the males were found to suffer from typical red-green blindness, the proportion in European races being about 4 per cent. In most races of low culture colour-blindness is less frequent than in

* 'Reports of the Cambridge Anthropological Expedition to Torres Straits.' Cambridge, vol. 2, Part I, 1901, and Part II, 1903.

† *Loc. cit.*, p. 48.

‡ 'Journ. Anthropol. Inst.', 1901, vol. 31, p. 229.

Europe, but the Todas show the highest recorded frequency of this condition in any race. By means of the genealogies preserved by the Todas the relationship between the colour-blind people could be traced, and a body of material was obtained which illustrates the mode of hereditary transmission of the defect.

The Todas were found to be subject to various geometrical-optical illusions; and quantitative observations were made on the illusion of compared vertical and horizontal lines and on the Müller-Lyer illusion. The Todas are subject to the former in a greater degree than English observers, and to the latter in a smaller degree. The two illusions differ in nature: the former is probably largely physiological in origin, and is neutralised by the experience of civilised life, while the latter is more strictly psychological in character; and the different reaction of the Todas to the two illusions is in accordance with this difference in their nature.

In every measurement the degree in which the individuals of each race differed from one another was studied; and a mass of material was collected for the study of variability in the reaction to psychological tests, and for the analysis of the complex conditions upon which the coefficients of variation depend.

On comparing the observations of Todas, Papuans, and Englishmen, all tested by the same methods, and chiefly by the same experimenter, it is found that there is some evidence of a correlation between the degree of general intellectual development and certain simple mental properties or activities which can be tested by experimental methods. In general intellectual development the Todas occupy an intermediate position between Papuans and Englishmen, and a similar intermediate position is occupied by them in connection with many of the tests.*

The social and religious institutions were also studied. The sociology was investigated largely by means of the genealogical method,† and the system of kinship, the complex marriage regulations and the laws of inheritance and property were worked out in detail.

The Todas were found to possess a highly elaborate religious ceremonial of which only brief sketches had previously been published, while many ceremonies had wholly escaped observation. In consequence, much time was devoted to the detailed investigation of this ceremonial and of the other features of the Toda religion. Evidence is given that this religion is one which has undergone degenerative changes, and some evidence is advanced

* A full account of the senses of the Todas will be published shortly in the 'British Journal of Psychology,' vol. 1, Part IV.

† 'Journ. Anthropol. Inst.,' 1900, vol. 30, p. 74.

in favour of a view that the Todas are a people who have once had a culture higher than that they now possess. When the customs and institutions of the Todas are compared with those of other parts of India, it is found that there is most resemblance with the people of Malabar; and the view is advanced that the Todas migrated to the Nilgiri Hills from Malabar, and are possibly allied in race to the two chief castes at present existing in that district, the Nairs and Nambutiris.

In addition to the work on the Todas, observations were also made on members of other tribes. The vision of the Sholagas and Uralis, two wild jungle tribes, was investigated* from several points of view; and observations, chiefly on colour-blindness, were made on members of other castes or tribes.

*A Study of the Process of Nitrification with reference to the
Purification of Sewage.*

By HARRIETTE CHICK, D.Sc.

(Communicated by Professor H. Marshall Ward, F.R.S. Received April 1,—Read May 11, 1905.)

Introduction.—That nitrification is a biological process was first established with certainty, after long controversy, in 1888, by the decisive experiments of Plath† and Landolt,‡ who in this matter confirmed the previous researches of Schlösing and Muntz,§ Warington|| and Soyka.¶

The discovery of the active living agents followed soon after, when Winogradsky** (1890 to 1892) isolated the two sets of organisms which, as he showed, co-operate to produce natural nitrification. These were (1) the nitrite-producer, *B. nitrosomonas*, which oxidises ammonia to the nitrite stage only and (2) the nitrite-producer, *B. nitrobacter*, which carries on the

* 'Bull. Madras Government Museum,' 1903, vol. 5, p. 3.

† Plath, 'Landw. Jahrbücher,' v. H. Thiel, vol. 16, hft. 6, and 'Centralbl. f. Agrikulturchem. v. Biedermann,' vol. 17, 1888.

‡ Landolt, 'Deutsch. Landw. Presse,' vol. 15, and 'Centralbl. f. Agrikulturchem.,' vol. 17, 1888.

§ Schlösing and Muntz, 'Comptes Rendus,' vols. 84 and 85, 1877, and vol. 89, 1879.

|| Warington, 'Journ. Chem. Soc.,' vol. 33, 1878, and 'Landw. Versuchsst.,' vol. 24, 1880.

¶ Soyka, 'Zeitschr. f. Biologie,' vol. 14, 1878.

** Winogradsky, 'Ann. de l'Inst. Past.,' vol. 4, 1890, and vol. 5, 1891; also 'Archives des Sci. biol. de St. Petersb.,' vol. 1, 1892.